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Introduction

There are increasing opportunities to use materials not traditionally used for livestock bedding. The purpose of this Factsheet is to provide information to assist in the evaluation of these alternative bedding materials.

As the more traditional methods of waste management become unfeasible, many companies are now considering different ways of managing their waste materials. Increasingly, agriculture is being considered as one of the options, and for high quality materials there is potential. Some of these materials are being used as livestock bedding. At the same time, more livestock producers are considering these alternatives to traditional bedding materials. The materials can vary from paper, wall paper and cardboard to paper fibre, recycled wood fibre and crushed wallboard. The properties of these and other materials are not as well known as the more traditional, straw and sawmill sawdust or shavings. Because of the wide variety and unfamiliarity with the waste materials, it is important that you evaluate their potential for use as livestock bedding.

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Evaluating Potential Bedding Materials

Before accepting a waste material for use as livestock bedding consider the following:

Absorbency

The material should be able to provide as dry or drier conditions than traditional bedding. Many non-traditional bedding materials such as shredded newspaper and wallboard are quite absorbent. Other materials can be much less absorbent. For example, vinyl coated wallpaper and plastics are made to repel liquid. It is because of this variability, non-traditional materials need to be carefully evaluated for their absorbency and for the amount of bedding required to maintain animal dryness and comfort. Table 1 lists average absorption capacities for some traditional and non-traditional bedding materials.

If there is no information on the absorbency of a prospective bedding material, it can be estimated using

the following method:

1. Place 1 kg (2 to 3 lbs.) of the intended bedding material in a bag made of porous but non-absorbent material (such as an onion bag or one leg of an old pair of panty-hose) and weigh it.
2. Place the bag in a pail of water and leave it completely immersed for 24 hours. Be sure to use enough water so that some free water is left in the container at the end of 24 hours. A 20 lb. (5 gallon) pail should be adequate.
3. Take the bag out of the water and hang to drain but only until it has stopped dripping, not so long that the sample has started to dry out.
4. Reweigh the bag of bedding and calculate the absorbency factor from the following formula:

   Absorbency Factor = (weight after soaking – original weight) ÷ original weight

If the bedding material and bag weigh 1 kg before soaking and 3.5 kg after, the absorbency factor is: (3.5 – 1)/1 = 2.5

For comparison the following table list the absorbencies of 10 materials averaged from several references. These figures are intended to be a coarse guide as absorbency of any material varies due to differences in initial moisture content and the degree of grinding.

Although absorbency is essential, other properties of bedding are also important. The compressibility, abrasiveness, roughness, and surface wetness of the bedding material all impact on animal comfort and ultimately to their health and productivity.

Table 1 – Densities and Absorbency of Traditional Bedding Materials

Material	Type or Form	Absorbency Factor*
wheat straw	baled	2.1
	chopped	2.1
barley straw	baled	2.0
	chopped	2.0
oat straw	baled	2.5
	chopped	2.4
hay	baled	3.0
	chopped	3.0
sawdust	hardwood	1.5
	softwood	2.5
shavings	hardwood	1.5
	softwood	2.0
corn stover		2.5
sand		0.3
peat moss		10.0

* weight of water held per unit weight of dry material; assumes initial moisture content of bedding < 10%

Inexpensive material that requires twice the amount of your current bedding may not be a good buy. The added costs of soiled bedding removal, storage and land application need to be considered when evaluating any bedding material.

Livestock Health And Comfort

The material should provide comfort. Non-traditional bedding materials may provide a more comfortable environment for the livestock than traditional materials. Alternatively, some materials pose livestock health risks due to physical and/or chemical contaminants. Studies have shown that, given a choice, livestock avoid uncomfortable bedding materials. It has also been shown that livestock discomfort is associated with decreased production, impaired health and increased production costs. Materials should be dust and mould free to lessen chances of lung and breathing problems for you and your livestock. Gypsum (wallboard) is very high in pH. The pH level will affect the types and growth of the microbial populations,

which live in any bedding material and may affect foot and udder health.

Physical Contaminants

The material should be free of foreign objects. Glass, nails and metal shards can cause physical injury both externally and internally, especially in cattle. Plastic may not be much of a concern in livestock bedding unless livestock consume it. Plastic, if ingested, could cause digestive obstruction or in some cases, death.

Chemical Contaminants

The material must be free of chemical contaminants. The risks with non-traditional bedding materials are variable and not well known. Depending upon the chemical, livestock could suffer external and/or internal injuries. Chemicals in the bedding could also cause contamination of the meat, eggs and milk produced.

Chemical contaminants are difficult to identify and their presence depends upon the original material and processing received. Lead, asbestos, volatile organic chemicals and wood preservatives are a few of the possible contaminants. In the past, newspaper ink contained lead and other compounds, posing a threat to animal health when it was used as bedding. Fortunately, newspapers have changed to a soybean or other edible oil-based ink that does not pose a threat to livestock.

The effect of chemical contaminants on crop production, and ultimately the environment, is also a great concern. Alternative bedding materials may contain chemicals in amounts harmful to crop production or the environment. For example, particle board and wall board contain high levels of boron, from boron-based glues and fire retardants. Boron can be toxic to some crops when applied in excess of 1 kg boron/ha (1 lb./ac). Land application of some materials in large quantities can affect soil pH, potentially reducing productivity.

Economics

The material should be priced competitively. Frequently, non-traditional bedding materials are inexpensive. Delivery may be free depending upon the source and location. Requirements for on-farm storage space often are reduced as many of these materials can be delivered on demand, year round. Cost variations may be small, compared to the seasonal price fluctuations of some traditional bedding materials like straw.

Management

Material handling should be convenient and fit into your current bedding and manure management system. Will the switch require a change in handling and processing equipment? Can your current manure handling, storage and spreading systems accommodate a change in bedding type? Sand, grit and other abrasive particles increase wear on equipment and settle out during storage, reducing storage capacity. Unless you were intending to make a major change, any material you consider should fit into your current handling, processing and manure systems.

Availability

How available is the material? How reliable is the supply? Non-traditional bedding materials may be more available than traditional ones. This may be especially true in areas with a small agricultural land base and high livestock densities. Proximity to the source may also reduce costs. Determine if the material is of consistent quality and will be available on a timely basis to meet your requirements. Switching from one material to another as your supply runs out may not be convenient.

Crop Production

The material should be biodegradable and suitable for crop production. The rate of breakdown and the products of decomposition are important considerations for crop production. As they decompose, some materials, depending on their composition, can tie-up important nutrients such as nitrogen for a period of

time, making it unavailable to the crop. The release of the nutrients following decomposition may not coincide with crop demand. This concern, however, does not apply to inorganic materials such as sand and ground wallboard.

Environmental Effects

The material should have little or no adverse effect on the environment. Physical or chemical properties of the bedding material and/or contaminants in the material can be detrimental to the environment. Large pieces of plastic that survive manure handling, storage and spreading are unsightly and environmentally irresponsible. Glass and metal shards spread on land are also a concern. The effects of chemical contaminants such as PCB's and heavy metals are harder to assess and, therefore, of greater concern.

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Quality Assurance

There is a wide variety of non-traditional materials available with potential for use as livestock bedding. Because of this variability, the quality will depend upon the type and source of the material. Materials of the same type could potentially have different contaminants and contamination levels depending upon the original source and/or the processing received. For example, wood waste from a lumber mill is relatively clean, while ground wooden pallets could contain any number of contaminants.

Companies providing these materials are not required to guarantee a quality product. Often the waste generator will not assure the quality or the consistency of a waste material from one load to the next. For this reason you should insist the bedding generator/seller have the material analyzed and provide you with proof of quality. Having test results for physical composition and chemical contaminants will help determine the suitability and identify the risks to livestock and for land application. All test results should be reported in easily understood language.

The report or analytical results supplied by the generator/seller should provide the following information:

- Chemical Contamination
  There are a number of tests that can be done to determine chemical contamination. The acid leachate test can be used to determine if a material is hazardous by detecting the level of soluble contaminants. Testing for the presence of arsenic, boron, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium and zinc will determine the suitability of the material for land application. Analysis should also be done for organic chemicals which may affect animal health and/or crop production, these include volatile organic, pesticides, wood preservatives and others. The need for these and other tests will depend upon the origin of the material and the processing it has received.
- Physical Composition
  The material should be determined to be non-hazardous before you consider the answers to the following questions:
  - What is the origin of the waste material?
  - What is it? (the main material and any contaminants)
  - How has it been processed?
  - What type of physical contamination, % volume, size? (i.e., plastic film, metal shards, glass, asbestos, etc.)
  - How dusty and what type of dust? (asbestos, fibreglass, mycotoxins, moulds, etc.)
  - What is the usable form? (powder, chunks, pellets, shavings)
  - What is the consistency of the material over time?

If you require advice on the analytical results, Abatement officers from the Ministry of the Environment and Energy are available to provide an interpretation as to whether the material is a potential risk to the environment. If you have a concern about livestock health, consult your veterinarian.

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Risks/Liability

The person receiving the material is potentially liable for any contamination caused by that material. Make it a point to always know what you are accepting. Examine the contents of each load before it is dumped. If the material has too many contaminants or if it is not as was promised, do not allow the material to be unloaded.

Make it the responsibility of the bedding generator/seller to provide you with information on the material prior to delivery. DO NOT accept material with the promise that information will follow! Once you accept delivery of the material there is no further incentive for the company to provide you with any information. Always remember, once it is dumped, you are responsible for the material!

Companies usually try hard to reduce any risks once identified. However, company personnel frequently lack the experience and knowledge needed to assess the waste for use as livestock bedding. It is important to ask for information on how the waste material you accept was produced, handled, stored and transported. Try to assess the risks at each stage for potential contamination. Consult experts who know the manufacturing process and experts that can help assess the animal risk.

If you have any questions or concerns in the following areas:

- For livestock production or comfort issues, contact a Livestock Advisor with your local Ontario Ministry of Agriculture and Food (OMAF) office
- For livestock health issues, contact your local veterinarian or OMAF Health Management veterinarians
- For environmental issues, contact your local office of the Ministry of the Environment (MOE)
- For cropping issues, contact a Soil and Crop Advisor with your local Ministry of Agriculture and Food office.

Look in the blue pages of your telephone book under the Government of Ontario for current locations and listings.

Livestock bedding is a relatively new use for waste materials. Because of this lack of familiarity, it is very important to evaluate these materials particularly in regards to livestock health, crop production and environmental safety. If after evaluation there is a concern with the material, the safest option is not to use it. However, there is potential for using high quality waste materials as livestock bedding.

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